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**Embedded Access Information For Digital Versatile Disc (DVD)
Independent of DVD Player Software**

Background of the Present Invention

5 The Digital Versatile Disc (DVD) is a high-capacity multi-media data-storage medium designed to accommodate a complete movie on a single disc, content-rich multi-media or very high-quality multi-channel audio. DVDs have become quite popular, the market for DVD having grown faster than compact discs (CDs) or VHS video cassettes did during their first two years. The most popular of the DVD formats is the DVD-VIDEO format, which is a format for
10 video content which can be played on domestic DVD players and DVD-ROM drives. The DVD-ROM format is for delivering data and multi-media content which can be played by computers equipped with DVD-ROM drives.

DVD-ROM drives are becoming quite popular and are now standard on many high-end computers. Typically, the DVD-ROM hardware is accessed by the
15 peripheral device access functions of the operating system. The data from the DVDs is provided to DVD player software. The DVD player software allows the computer user to access the various content of the DVD. One popular use of

DVDs for computer-based systems is for displays and presentations by companies to potential customers and employees.

5 The DVD players and discs operate in accordance with the official DVD specification, currently the DVD video specification version 1.1. The official specification was developed by a consortium of ten companies: Hitachi, JVC, Matsushita, Mitsubishi, Philips, Pioneer, Sony, Thomson, Time Warner, and Toshiba. Representatives from many other companies also contributed in various working groups. In May 1997, the DVD Consortium was replaced by the DVD Forum, which is open to all companies, and as of February 2000 had over 220
10 members.

A difficulty with DVD systems is that they do not allow access to information other than that stored on the DVD. Once a DVD is produced, the content of the DVD can not be updated.

15 It is desired to have an improved DVD system that allows access to the information not stored on the DVD itself.

Summary of the Present Invention

The present invention uses embedded information in DVDs to obtain resources outside of the DVD. The embedded information preferably uses resource indications such as Uniform Resource Locators (URLs) or a file
20 indications. The resource indication is used by an application program to access the resource. This resource (such as a web page) can contain the most current information.

In a preferred embodiment, the embedded information is supported by the operating system, preferably an extension to the operating system. The operating
25 system, in a preferred embodiment, checks the DVD for resource indications and associated sector address regions when the DVD is placed into the hardware player. The resource indications and associated sector address regions are

preferably stored in a portion of a DVD file, such as the Video Title Set navigation information file-- "VIDEO_TS.IFO". The resource indications and associated sector address regions are stored on the DVD in a manner that they are ignored by systems that do not support embedded information. In one embodiment, the resource indications and associated sector address regions are stored in a vendor specific field of a text portion of the file. Other DVD players will not access this vendor specific field.

When the DVD is played, the operating system examines all requested sector addresses of DVD data for addresses associated with one of the resource indications. If an association is found, the operating system starts an application program and provides the one of the resource indications to the application program to obtain a resource. Since the requested address are examined by the operating system, the starting and resource-indication-providing steps need not be done under the control of DVD player software.

Having the operation of the system of the present invention independent of the control of a DVD player software is advantageous. One way to support embedded information for DVD is to have the DVD player software modified to support such embedded information. The problem with modifying the DVD player software is that it requires such DVDs with embedded information to be used only with the DVD player software systems that support embedded information. Thus the embedded-link system would not work with all of the DVD player software that supports the DVD specification. By using operating system software, in particular operating system extension software, this problem is avoided. The system of the present invention can be used with a variety of different DVD player software systems without requiring any modifications to the DVD player software.

In one embodiment, the resource indication is stored in a text portion of the DVD and associated with a sector address range on the DVD. When the operating system requests DVD data from a sector address range, the operating system starts

the application program and provides the resource indication to the application program to obtain the resource. This operation can be done at any time during the operation of the DVD.

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Brief Description of the Drawings

Fig. 1 is a diagram of one embodiment of the system of the present invention;

Fig. 2 is a flow chart illustrating a method of one embodiment of the present invention;

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Fig. 3 is a flow chart illustrating one embodiment of the system of Fig. 2 using a DVD sector address buffer;

Fig. 4 is a diagram of an example of the method of Fig. 3.

Detailed Description of the Preferred Embodiment

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Fig. 1 shows the application program layer with the DVD player software 22, web browser 24 and other application programs 26 operably connected to the operating system 30. The operating system 30 is operably connected to the DVD hardware 40. The DVD player software 22 initiates data requests to the operating system 30. The operating system 30 uses control signals sent to the DVD data hardware to obtain data from the DVD 42. This DVD data is sent from the DVD data hardware 40 to the operating system 30 that provides it to the DVD player software 22. The DVD discs, player hardware, and player software operate in accordance with the official DVD specification.

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In the preferred embodiment of the present invention, the operating system includes an operating system extension 32. The operating system extension 32 can be, for example, a dynamically loaded library, driver or other unit. The operating system extension 32 examines the DVD data sector address for sectors associated with resource indications. A buffer is used by the operating system to store the address requested from the DVD data hardware 40. The system extension

software 32 periodically examines these buffered addresses to determine whether there are any addresses that correspond to a resource indication, such as a URL. If the DVD player software 22 requests DVD data associated with a resource indication, the system extension software 32 starts an application program which then receives the resource indication. In one embodiment, the resource indication is a URL which is provided to a web browser 24. Alternatively, the resource indication can point to any other type of resource. For example, the resource indication could be a file indication that brings up data stored in a file of the computer or network.

10 The advantage of having the operating system examine the DVD addresses is that the DVD player software 22 need not be modified to support the obtaining of content external to the DVD.

 In one embodiment, before the DVD is played, the system extension software 32 checks the DVD for the existence of any resource indication. In a preferred embodiment, the DVD 42 stores within a text region a list of the different resource indications and an indication of the associated DVD sector address ranges in which these resource indications are embedded.

 In one embodiment, the URLs and indication of the associated sector address are encoded in the text of a DVD disc file that is examined by the system before playing the DVD. In one embodiment, the Video Title Set navigation information file -- "VIDEO_TS.IFO" -- defined by the official DVD specification is used. The Video Title Set navigation information file contains the menu information that is brought up when a DVD disc is loaded into the machine. In one embodiment, the indication of the sector address is a DVD menu location from which the sector address range is determined. The text stored in the file is preferably encoded to allow all possible characters to be expressed. The resource indications and associated sector address regions are stored on the DVD in a manner that they are ignored by systems that do not support embedded information. In a preferred embodiment, the resource indications and associated

sector address regions are stored in a vendor specific field of a text portion of the DVD file. Other DVD players will not access this vendor specific field.

In one embodiment, the requested addresses are buffered before examination. The short delay in starting up the web browser 24 or other
5 application program 26 will not be significantly noticeable.

If there are no resource indications stored in the specific DVD text region, the system extension software 32 does not buffer and examine the addresses requested from the DVD hardware 40. This prevents the system extension software 32 from unnecessarily taxing processor resources.

10 In a preferred embodiment, the DVD 42 contains the system extension software. When the DVD 42 is first run, the system extension software is loaded into the operating system 30. The system extension software 32 need only be loaded once to implement the embedded resource links. In one embodiment, system extension software for multiple common operating systems is stored on the
15 DVD. In one embodiment, system extension software programs for Apple operating systems and/or Microsoft Windows-based operating systems are stored on the DVD 42.

Fig. 2 is a flow chart that illustrates the method of the present invention. Step 50 comprises loading the operating system extension software into the
20 operating system. In one embodiment, the system extension software on the DVD is loaded into the operating system. Upon restart of the computer, the system extension software will be part of the operating system. In step 52, a DVD is placed into the DVD player hardware.

In step 54, the operating system extension software reads a text portion of
25 the DVD to obtain the resource indication on and associated sector address ranges. Alternatively, the type of application program can be implicit in the resource indication. For example, a URL indication can cause a web browser to start.

In step 56, it is checked whether any embedded information is stored in the DVD. If not, the system extension software lays dormant in step 58. This prevents the system extension software from taxing the resources of the computer when the DVD does not have any embedded resource indications.

5 If there are resource indications in the DVD, in step 60, the operating extension examines addresses requested from the DVD player software. The requested addresses are preferably buffered. In step 62, it is checked whether the address corresponds to a resource indication. In one embodiment, this
10 correspondence is indicated by the requested sector addresses matching the sector addresses associated with the resource indication. If there is a match, in step 64, the application program is started and the resource indication is provided to the application program to obtain the resource. The operating system extension continues to examine the data sector addresses requested while the DVD player hardware operates.

15 Figure 3 is a flow chart illustrating one embodiment of the system of Figure 2 using a DVD sector address buffer.

 Figure 4 is a diagram of an example of the method of Figure 3.

 It will be appreciated by those of ordinary skill in the art that the invention can be implemented in other specific forms without departing from the spirit or
20 character thereof. The presently disclosed embodiments are therefore considered in all respects to be illustrative and not restrictive. The scope of the invention is illustrated by the appended claims rather than the foregoing description, and all changes that come within the meaning and range of equivalents thereof are intended to be embraced herein.